

Mooring Operations and Support for NRL Rags 2003 Experiment

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LONG-TERM GOALS

The long-term goal of the Mooring Operations and Support for the NRL RAGS experiment was to provide the Naval Research Laboratory with expertise in design and deployment of moored platforms for obtaining acoustic data in the New Jersey Bight area under winter conditions.

OBJECTIVES

Our specific objectives for this project were to provide mechanical engineering design, mooring design, and field operations support for the RAGS moorings. The tasks required to meet these objectives included the mechanical design of specialized mooring components, bottom frames, and instrument housings, mooring fabrication, organizing cruise logistics, leading the field operations and working with the researchers to optimize the use of the moored array platforms.

APPROACH

The RAGS experiment moorings included three acoustic sources and four receive arrays. The receive arrays included three vertical line arrays and one horizontal line array.

WHOI designed and fabricated moorings for the three acoustic sources, which included Webb Research 224, 300, and 500 Hz sources. WHOI designed and fabricated bottom frames, pressure housings, and electronics packaging for the three "DODO" vertical line array systems developed by NRL. The horizontal line array mooring utilized the "MOAS" sled developed for the ASIAEX experiment in 2001. For RAGS, WHOI refurbished and re-batteried the MOAS sled, and packaging was designed and fabricated for the new electronics system developed by NRL. The horizontal line array was married to two lengths of mechanical wire rope to provide strength and weight, and an embedment anchor sled was designed and fabricated to ensure that the array would remain straight on the bottom.

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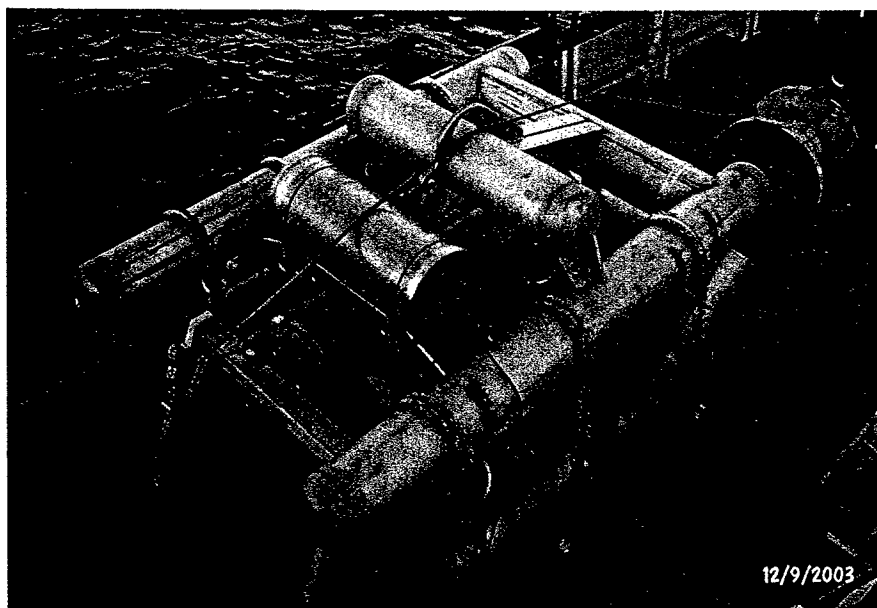


Figure 1. MOAS bottom sled on deck prior to deployment.

Figure 1 shows the MOAS bottom sled designed and built at WHOI for NRL in 2001, and reconfigured for RAGS in 2003-2004. This sled contains the batteries and electronics for the horizontal array mooring, shown in Figure 2.

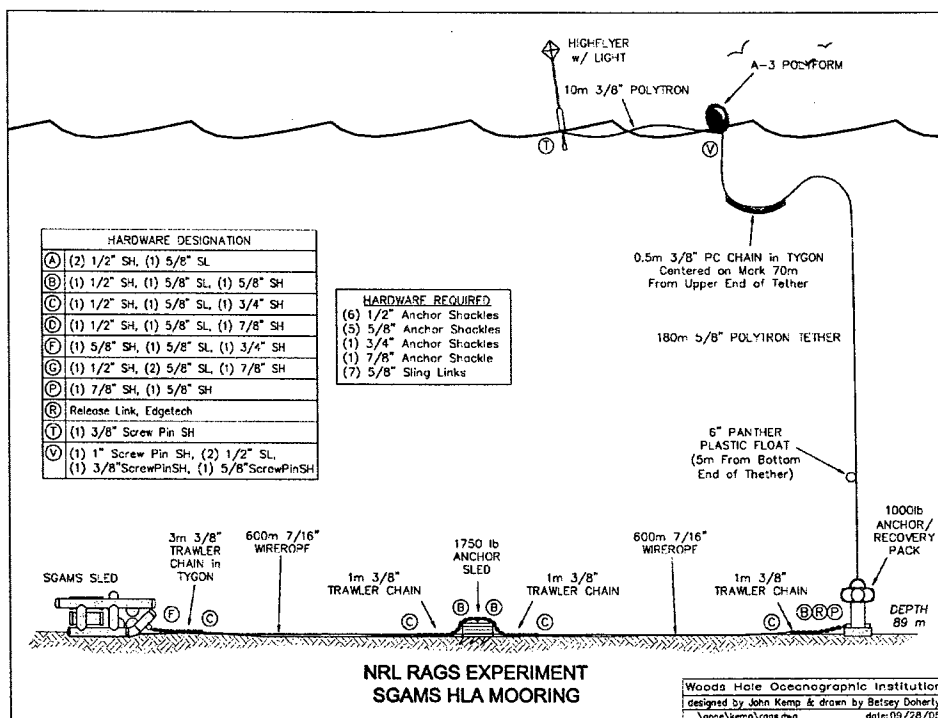


Figure 2. MOAS HLA mooring design.



Figure 3. DODO bottom frame on deck prior to deployment.

Figure 3 shows a DODO bottom frame housing batteries and electronics for a vertical array, on deck and ready for deployment. The mooring design for the DODO arrays is shown in Figure 4.

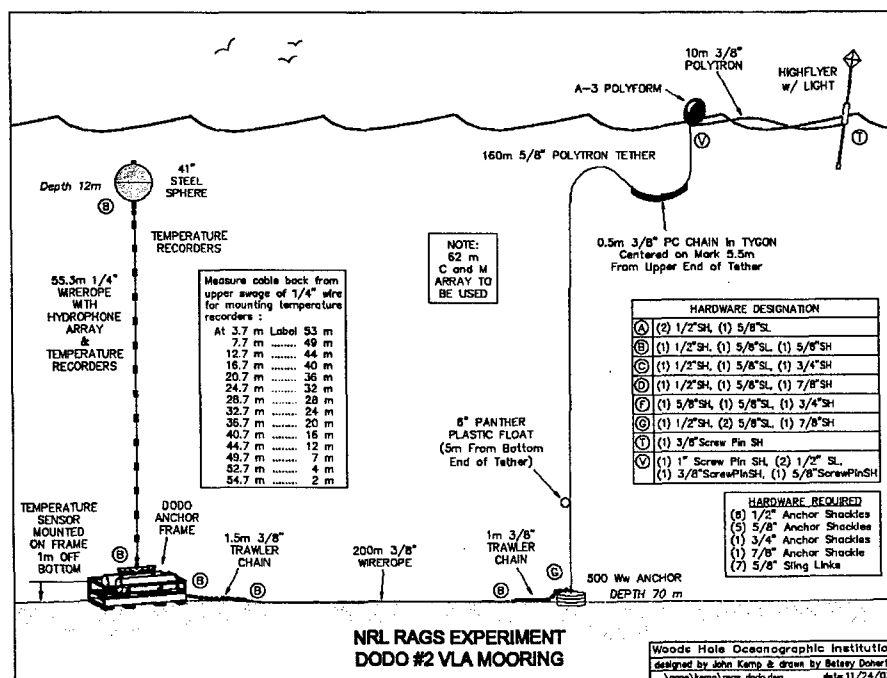


Figure 4. DODO VLA mooring design.

WORK COMPLETED

The RAGS moorings were deployed using the Research Vessel Oceanus from the Woods Hole Oceanographic Institution and recovered from the Research Vessel Endeavor from the University of Rhode Island. Figure 5 shows the area of the experiment, and locations for the source and receiver moorings deployed under this contract, as well as thermistor string and ADCP moorings deployed by NRL under other contracts.

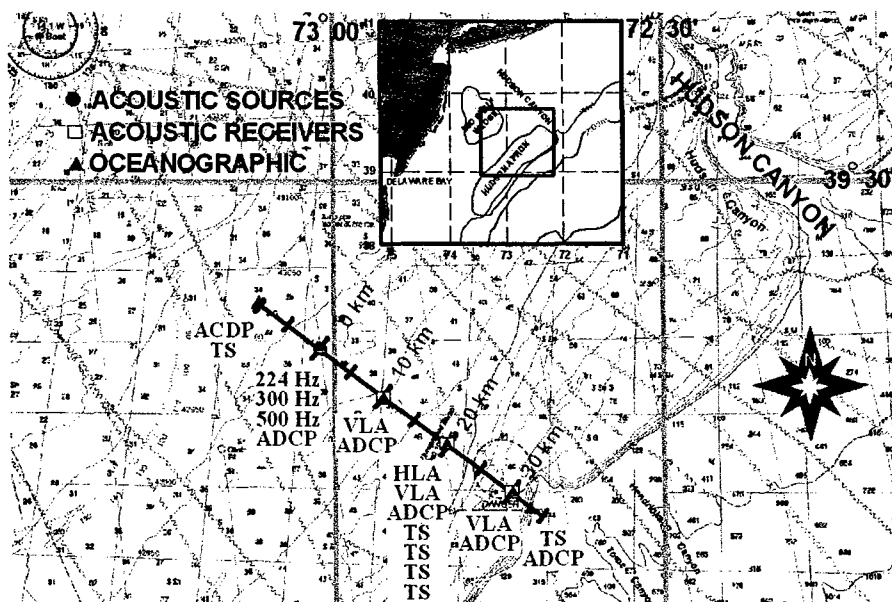


Figure 5. Chart showing mooring locations for RAGS experiment. Inset shows the location of the experiment in the New Jersey Bight area.

The deployment period was December 03, 2003 to January 20, 2004. The newly developed mooring systems facilitated the acquisition of a high quality data set. All the mooring designs performed as expected.

RESULTS

The seven RAGS moorings were successfully designed, fabricated, and deployed. The moorings functioned properly for the duration of the experiment. All moorings were successfully recovered. The horizontal line array cable was severely damaged by fishing gear, but was recovered by dragging. 92 of the 96 hydrophones were saved for future use, although the cable was a loss. All NRL gear was prepared for storage by WHOI and shipped to NRL for storage, late in 2004.

IMPACT/APPLICATIONS

The New Jersey Bight area has been the site of several previous major acoustic experiments, such as the Hudson Canyon Experiment (September 1988), ACT II (September 1993), SWARM 95 (July 1995), SWAT 00 (September 2000), Acoustic Clutter Reconnaissance (April 2001), Boundary 01 (May 2001), Main Acoustic Clutter (April 2003), and TRex 04 (April 2004).

The RAGS experiment was extensively instrumented, under this contract and others, to measure both acoustic and oceanographic properties of the local environment. This work will facilitate scientists' ability to quantitatively establish the relationship between the temporal variability of vertical and horizontal array gain and the fluid dynamics that perturb the sound speed near the continental shelf break (100-500m). It will also aid in determining the scales of the fluid dynamics processes and bottom bathymetry variability that must be incorporated into integrated non-hydrostatic fluid dynamic and 3-D acoustic propagation model being developed by allied projects.